REMARKS

General:

Claims 19, 21-26, 28-31 and 34-42 were pending in the application before this amendment. Claims 19, 21-26, 28-31 and 34-42 are canceled. Claims 43-62 are new.

The previous claims have been rewritten to clarify the syntax, and eliminate repetitive and non-limiting language. In addition, the claims have been re-ordered so that dependent claims directly follow the claims from which they are dependent, as follows:

New claim	Old claim		New claim	Old claim		New claim	Old claim
43	**19**		50	28		**57**	**34**
44	22		51	29 (part)		58	36
45	23		52	30		59	37
46	24		53	31		**60**	**38**
47	26		**54**	**21**		61	41
48	25		55	39		62	42
49	29 (part)		56	40			

Except as discussed below, the new claims are framed to have substantially the same scope as their predecessors.

Previous claim 29 was split into new claims 49 and 51, because it appeared to present two distinct features (a ferromagnetic core and a U or E-shaped yoke for multiple field planes.)

No new matter has been added by this amendment.

The applicant thanks the examiner for the courtesy extended to applicant's attorney (Henry Blanco White, reg. no. 47,350) at an interview at the U.S. Patent and Trademark Office on April 10, 2007. The substance of the interview, to the extent not already dealt with in the examiner's Interview Summary, is set out below.

35 U.S.C. § 112:

Claims 19 and 35 were rejected under the written description requirement on the ground that the maximum and minimum angle between the magnetic field planes were defined in language not supported by the description. New claim 43 filed herewith recites a "predefined angle," for which support is found in claim 1 of the English text filed under § 371. Previous claim 35 is canceled and not replaced.

This rejection is therefore moot.

35 U.S.C. § 102:

Claims 19, 21-26, 28-31, and 34-42 were rejected as anticipated by U.S. Patent No. 3,551,794 (Vander Heyden). The rejection is traversed. At the interview, the examiner pointed out that the syntax of claim 19, which started as a translation of the French text of claim 1 and has been amended more than once, was not entirely easy to follow. New claim 43 has therefore been rewritten. Except as noted elsewhere in this response, claim 43 does not differ in scope from the previous text of claim 19, but claim 43 is believed to be more immediately understandable.

The present invention, as now claimed in claims 43, 54, and 57, has the following features:

a) A first coil or pair of coils generates a first magnetic field;

b) A second coil or pair of coils generates a second magnetic field;

c) The first and second fields lie in (and define) a common magnetic field plane;

d) The amplitudes of both of the first and second fields vary over time;

e) The resultant of the first and second fields is a field with an amplitude that varies over time and a direction that moves at a variable angular velocity (which implies that the first and second fields intersect).

The present invention, as now claimed in claim 60, has the following features:

a) Generating a first magnetic field;

b) Generating a second magnetic field;

c) The first and second fields lie in (and define) a common magnetic field plane;

d) The first and second fields are oblique to one another;

e) The amplitude of at least one of the first and second fields vary over time;

f) The resultant of the first and second fields is a field with an amplitude that varies over time and a direction that moves at a variable angular velocity (which implies that the first and second fields intersect).

The cited Vander Heyden reference has (see Fig. 1) five coils or pairs of coils.

a) H_0 Solenoid coil 12.

b) Solenoid coil 18.

c) RF injecting coil 20 (which may be a pair of coils, see col. 3, lines 47-53).

d) Receiving coil pair 22, 24.

e) H_1 field coil 26 (which may be a pair of coils, see col. 3, lines 61-64).

The amplitudes of solenoid coils 12 and 18 do not vary over time. They are clearly shown in Fig. 1 as being powered by a simple DC supply. Receiving coil pair 22, 24 does not generate a magnetic field. That pair is clearly shown in Fig. 1 as being connected only to the input of amplifier 46. The only coils that produce a time-varying field are coils (or pairs of coils) 20 and 26. But coils 20 and 26 are spaced apart so that they do not combine to form a resultant field. That separation is essential to Vander Heyden's device, because Vander Heyden is measuring the time taken for fluid to flow from the coil 20 to the coil 26.

In Fig. 5 of Vander Heyden, the solenoid coil 18 and the RF injecting coil 20 have been replaced by a square-wave modulated DC solenoid. However, the modulated DC solenoid 18 is still positioned far enough from the H_1 field coil 26 that the fields of the two coils will not form a resultant field of varying direction.

Thus, in Vander Heyden's system:

- In contrast to the method of applicant's claims 43, 54, 57, there is never more than one coil or pair of coils generating a varying field in any given place at any given time;
- In contrast to the method of applicant's claim 60, all of the coils are parallel or perpendicular, never oblique.

Thus, there are no first and second coils in Vander Heyden that have all the features of the first and second coils recited in any of claims 43, 54, 57, and 60 and those claims, together with claims dependent therefrom, are not anticipated. Further, there is nothing that would have motivated a person of ordinary skill in the art to modify Vander Heyden's system to provide two varying magnetic fields that interact to produce a resultant field moving with variable angular velocity, or to align any of the fields obliquely to each other.

It is therefore respectfully submitted that the present invention, as now claimed, is not only new but also non-obvious over the cited Vander Heyden reference.

At the interview, the examiner also expressed some concern whether the invention as claimed might be accidentally anticipated by conventional nuclear magnetic resonance imaging (NMR or MRI) technology, but conceded that she was unable to produce any document showing an anticipating NMR apparatus. It is recalled that the question of NMR apparatus was previously raised at an earlier interview in July 2003, and pursued in the office action mailed September 9, 2003, with reference to U.S. Patent No. 6,489,872 (Fukushima et al.) and to earlier documents cited by Fukushima, and that the rejection was then withdrawn. Applicant and his representatives have investigated the examiner's concern and, as far as they have been able to determine, the present invention as now claimed is not anticipated by, nor obvious over, conventional NMR apparatus.

Essentially, a conventional NMR device has:

- a static field coil, which generates a constant field;

- an RF excitation coil (or pair of coils) with its axis perpendicular to the field coil, which generates an RF magnetic field in intermittent bursts; and
- one or more receiver coils that detect electromagnetic fields but do not generate a field.
- There may also be one or more gradient coils. The gradient coils are adjustable, but are set to a fixed value during the excitation bursts.
- All of the coils are aligned along one or other of the three principal axes of the machine.

Thus, in a conventional NMR device:

- In contrast to the method of applicant's claims 43, 54, 57, there is never more than one coil or pair of coils generating a varying field at any given time;
- In contrast to the method of applicant's claim 60, all of the coils are parallel or perpendicular, never oblique.
- In addition, as explained in applicant's response filed April 16, 2004, an NMR apparatus would not be capable of carrying out the methods of the present invention, because the frequency of the excitation field is too high, and its amplitude compared with the static field is too low, to produce the stereochemical deformations recited in applicant's claims.

As an example, the examiner is referred to U.S. Patent No. 4,115,730 (Mansfield). Peter Mansfield was one of the original inventors of NMR technology. Mansfield's device has a static magnetic field B_0, a system of gradient coils G_x, G_y, G_z, an RF excitation coil (4^{th} row in Fig. 3), and one or more receiver coils. Mansfield's B_0 coil is static. Mansfield's receiver coils do not generate a magnetic field, but instead detect electromagnetic signals. Mansfield's gradient coils are adjustable, but they are adjusted between bursts of RF excitation, and remain set to a specific gradient field while the RF excitation coil is activated. Mansfield never has two time varying fields active in the same place at the same time. That makes perfectly good sense, because Mansfield wants easily interpreted signals,

so he wants the simplest configuration that will give him a signal. It would not have been obvious to modify Mansfield's system, or any other conventional NMR system, to have intersecting time varying fields producing the sort of time varying resultant field provided by the present invention, or to have obliquely angled fields, because the varying or oblique field would seriously hinder the NMR measurements.

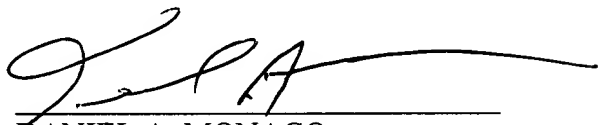
It is therefore believed that the present invention, as now claimed in claims 43-62, is not only new but also non-obvious over conventional NMR technology.

Conclusion:

In view of the foregoing, reconsideration of the examiner's rejections and allowance of claims 43-62 is earnestly solicited.

Respectfully submitted

MICHEL RIERA

BY: 

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